

January 2007

Owners Manual & Reference Guide



GPRS Dual- Band Automatic Vehicle Locator (850/1900 MHz) Model: MT0505KE

© by Columbus Nova Technology Group, LLC All rights reserved — The Specifications and information regarding the products in this manual are subject to change without notice. All statements, information, and recommendations in this manual are believed to be accurate but are represented without warranty of any kind, express or implied. Users must take full responsibility for their applications of any Products. Reproduction of the contents of this manual, in whole or in part, without written permission of Columbus Nova Technology Group, LLC, is prohibited.

Important!

Before installing, turning on or operating the NovaTracker MiniTrac Unit, ensure compliance with all safety regulations.

INDEX

| | |
|-------------------------------|-----------|
| Introduction | 4 |
| Hardware Installation | 6 |
| Operation | 10 |
| Specifications | 12 |
| Product Information | 14 |
| Antennas | 15 |
| Event Codes | 16 |
| Message Format | 20 |
| Regulation | 22 |
| Trouble Shooting Guide | 23 |

Introduction

CNTG's NovaTracker™ MiniTrac Unit system provides a very low cost but powerful solution for automatic vehicle location and other GPS tracking applications. It combines GPS technology with GSM cell phone networks, and is designed for multiple automotive applications such as vehicle tracking, monitoring, remote control, and GPS data logging.

The MiniTrac works with any private or public IP network architecture. The unit comes standard with power and ground, ignition on/off, and GPS and GSM antenna (50 ohm) inputs and optionally one other digital input and one zero to +12V analog input.

The MiniTrac is an event driven unit, messages are sent based on events. It records time, speed, distance, position and I/O status. Event thresholds are user programmable using the NovaTracker MapTrac client software or any IP based network.

Features

- GSM and GPS LED indications
- Vehicle position, speed, direction, date, time, event, status
- Compact, lightweight, and rugged
- Remote Configuration and Firmware upgrade
- Easy to install
- Solid state design
- Accepts standard SIM card
- Geo-Fencing
- 2 Digital Inputs (1 reserved for ignition on/off)
- Data logger ready device with 4MB internal flash memory



Event Triggers

- Pre-set time interval
- Pre-set distance interval
- I/O status change (e.g. Ignition On or Off)

- Pre-set Speed
- Geo-fence boundaries (optional)

GPRS worldwide coverage is divided into 900/1800 and 850/1900 band. The NovaTracker™ MB is suitable for the USA, Canada, Mexico, and countries in Central and South America (except Brazil).

The unit is delivered without a SIM card. A GPRS compatible SIM card is required to activate the unit. GPRS works through SMS (Short Message Service), commonly known as Text Messaging Service. A registered SIM card must be placed into the MiniTrac SIM cardholder to allow reporting over the GPRS cellular data network. SIM cards can be purchased and registered through your local GPRS carrier.

The NovaTracker™ MiniTrac can collect data without the SIM card. Up to 4000 points of data can be stored. However, to retrieve this data, the unit must be powered down, the SIM card installed, and then powered on.

The only other requirement for operation is an ignition ON/OFF signal and a 12V-30V DC power source such as a car / truck's power supply or battery.

Before installing the NovaTracker™ MiniTrac Unit:

Please make sure that you have a SIM card that satisfies the following requirements:

- Caller ID from your GPRS service provider allowed
- Short Message Service (SMS) activated and supported by your GPRS service provider and activated
- All PIN protection is removed

Hardware Installation

The standard installation of the NovaTracker™ MiniTrac requires connection to a constant power supply (+V and GND), a switched power indicator (Ignition on/off) and the placement of the GPS, GPRS antenna. Total installation time is often less than an hour.

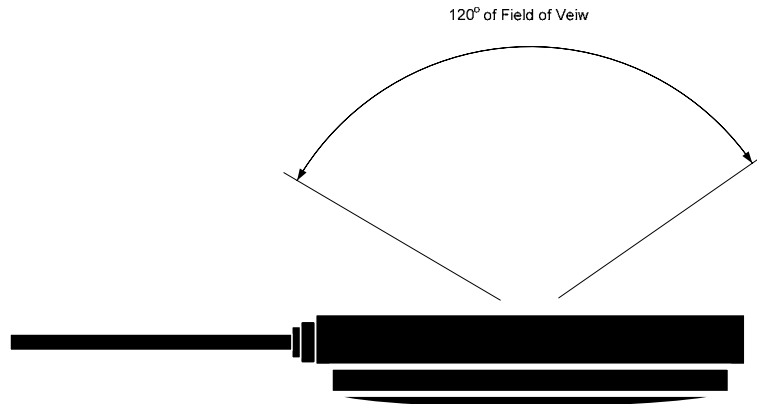
Optionally, a 2nd digital in and an analog in can be placed at convenient locations in the vehicle and connected to sensors and vehicle controls. Connections are typically made by crimping connectors directly to the appropriate wires. However, these connections are not required. Only a constant power supply and a switched power indicator are required.

The MiniTrac contains the system's primary electronic components. Always mount the main module in the vehicle's interior compartments, in a covert and secure location, ensuring that moisture, vibration and temperature extremes are minimized. Acceptable locations include behind the dash, behind the glove compartment, in the trunk, under the seat or other interior panels.

Important!

The unit should be powered off before inserting the SIM card, connecting antennas, and inputs. Connect the unit's ground (black) wire to vehicle ground first. Otherwise, an electrical short may occur and damage the unit

GPS/GPRS Dual Mode Antenna Installation



Dual Mode Internal GSM/GPS Antenna

When mounting the antenna, please consider the following:

- **The view of the sky must be as wide as possible**
- **The field of view must not be obscured by any cable or metallic object (including windshield wipers, front windcreens with heating, UV filters or metallic tints)**
- **The active side of the antenna (bottom of the antenna on stick-on models) should point towards the field of view**

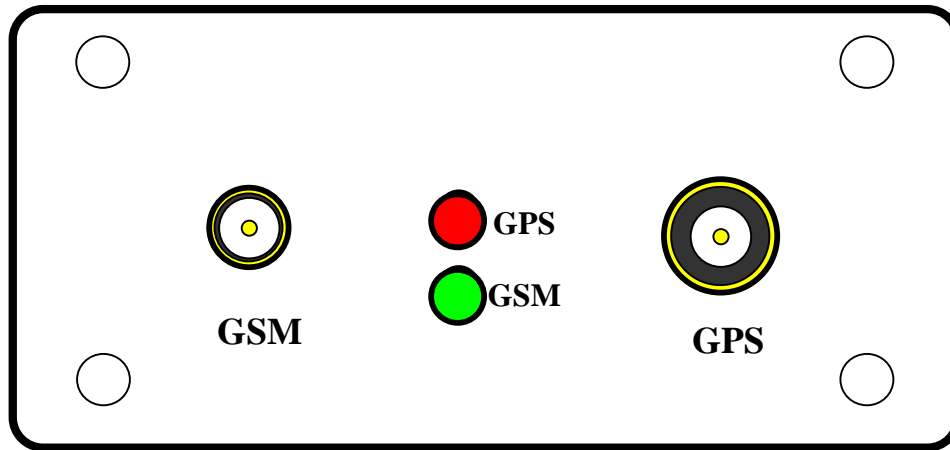
Considering these points, either the GPS antenna should be mounted under a window, normally the front or rear screen, as these generally provide the maximum view of the sky.

Antenna Installation Guidelines

- Antenna must be mounted securely.
- RF connectors must be properly connected to the RF cable. Be sure to use proper crimping tools.
- Use a good quality low loss cable as provided
- Mount GPS antennas where they will see the most sky
- Mount antennas in areas with enough space for a ground plane.
- Do not mount antennas too close to another antenna; at least 2 inches (6 cm.) of separation are required

- Do not mount antennas close to people; always leave at least 7inches (+/-20cm).
- Do not mount antennas where they are covered or blocked by metal.
- Do not mount antennas close to electronic management control systems

Front Panel Connectors



- GPS (SMA - female) antenna cable connector
- GSM (FME - male) antenna cable connector

Back Panel Wiring

| Color | Usage | Comments |
|--------------|-----------------|------------------|
| Red | V Input | + 12V to +30V V |
| Black | Ground | GND |
| White | Ignition on/off | GND to +12V /GND |
| Blue | Analog in | 0 to +12 V |
| Yellow | Digital in | 0 to +12 V |

Status Indication

The unit is supplied with two Red/Green LEDs used to reflect the status of the GSM and GPS connections. The sequence of operation is described below:

1. At power up, each LED will go thru a sequence of flashes, both red and green, indicating the unit is booting up
2. Both will then display red indicating no valid network connections
3. Next the unit begins a search for a valid GSM connection, once achieved the GSM LED (top most with unit in upright position) will display green and stay green until a loss of connection is detected.
4. The unit then begins the task of obtaining a valid GPS network connection, once achieved the GPS LED (bottom LED when unit is in upright position) will display green and stay green until an invalid GSM message is received or until the unit detects the loss of the GPS network connection.

I/O functionality – Description

Digital Ports

Two digital-in, connections are available. A standard one supplied with all units and designated for Ignition On/Off, and a 2nd, optional, digital-in connection is available for status monitoring of functions such as door Open/Close. Each accepts a zero to +12V digital input.

- A low-to-high or a high-to-low digital in transition will cause an event transmission
- The ignition On/Off input is set to a factory default of “active hi”. That is, a high-level voltage input (>10V) will register as a logic “1”; a low-level voltage input (<2V) will register as a logic “0”. As an option, this polarity can be reversed by request at the time of order.
- The ignition On/Off input must not be left floating and if unused should be tied to a constant +12V signal.

- The optional user defined digital-in port is set to a factory default of “active low”. That is, a low-level voltage input (<2V) will register a logic “1”; a high-level voltage input (>10V) will register a logic “0”. If left floating (e.g. unconnected) the input will report the same as high-level input.

Analog Port

One optional 10-bit analog-to-digital (ADC) input channel is available with the following characteristics:

- Range: zero to +12V
- Resolution: 11.72 mV
- Accuracy: +/- 100 mV

Power consumption

The MiniTrac Unit typically consumes 90mA in communication mode; approximately 15mA in idle mode.

Patience is recommended when first starting the system. It may take the GPS longer to acquire when a system is first installed (or has been out of operation for over a week) so it is recommended that the system be left for at least 6 minutes with the antenna and power connected before attempting communications for the first time.

Specifications

Technical Specifications

Following are the technical specifications for the MiniTrac Unit Vehicle Tracking device including:

- Power requirements
- GSM /GPRS Modem
- GPS satellite receiver
- Digital Inputs
- SIM card holder

| | |
|---------------------|---|
| System Power | |
| Supply Voltage: | 12 – 30 volts DC |
| Supply Current: | 90 mA normal operation (1A peak, 10 ms burst) |
| | 15 mA standby mode |
| | < 1 mA sleep mode |
| | |
| | |

| | |
|--|---|
| GSM /GPRS Modem | |
| Dual Band | 850/ 1900 MHz |
| GPRS class | 10 |
| GPRS mobile station class | B |
| Output Power Compliant to GSM phase 2/2+ | Class 4 (2 W @ 850/900 MHz) Class 1 (1 W @ 1800/1900MHz) |
| Temperature Range | -25 to +50 °C |
| | |

| | |
|-------------------------------|----------------------------|
| GPS Satellite Receiver | |
| Frequency | L1 Frequency (1575.42 MHz) |
| C/A Code | 1.023 MHz chipping rate |
| Channels | 12 |
| Accuracy | |
| Position | 3~15meters |
| Velocity | 1 meter/second |
| | |

| | |
|----------------------------------|-------------|
| Digital Inputs (standard) | |
| Number of Inputs | 2 |
| Specialized Input | Ignition On |

| | |
|----------|-----------------------------|
| Input #2 | On: 12 Volts DC |
| | Off: float or ground |

Note: via jumpers, each input can be reconfigured to be active high (+Vbat) or active low (ground)

| | |
|------------------------|-----------|
| SIM Card holder | |
| GSM11.11 | Compliant |
| ISO7816 | Compliant |

Product Information



NovaTracker™ MiniTrac Unit

GPS/GPRS Dual Band Antenna CNTG-R30 with SMA and FME.





CNTG-R30 SPECIFICATIONS

| GPS Antenna | | GSM Antenna |
|------------------------------|--|-------------------------------|
| Features | High performance GPS Patch antenna with state-of-the-art low noise amplifier | 850~1900 MHz |
| Frequency | 1575.42 MHz | 850 MHz ~ 1900 MHz |
| Polarization | RHCP (right hand circular polarization) | Vertical |
| Gain | 27 dBi typically | 3 dBi |
| Noise Figure | 1.2 max. | 1.2 Max |
| Attenuation | 20dB min. @ F0+/-50MHz | ----- |
| Band Width | 10 MHz Min | |
| VSWR | 1.5 Max | 1.5 Max |
| Impedance | 50 ohm | 50 ohm |
| Power Supply | Power Consumption: 2.7~5.5 VDC / 28 mA | Power Handling Capacity: 40 W |
| Cable & Connector | 3M RG-174 SMA Connector | 3m RG-174 FME Connector |
| Operating Temperature | -35°C ~+85°C | -35°C ~+85°C |
| Storage Temperature | -40°C ~+95°C | -40°C ~+95°C |

Event Codes

The following list and detailed description contains the event codes and explanations of the event codes for the NovaTracker series of vehicle and asset tracking products.

Event Code List:

| Event Code | Description |
|------------|--------------------------------|
| 00 | Power On |
| 01 | Fixed time event |
| 03 | Distance triggered event |
| 04 | Enter low speed (Stop) |
| 05 | Exit low speed (Start) |
| 06 | Enter high speed (Speeding ON) |
| 07 | Exit high speed (Speeding OFF) |
| 08 | Ignition on |
| 09 | Input #2 ON |
| 10 | Input #3 ON |
| 11 | Input #4 ON |
| 16 | Ignition OFF |
| 17 | Input #2 OFF |
| 18 | Input #3 OFF |
| 19 | Input #4 OFF |
| 25 | Lost GPS |
| 26 | Acquire GPS |
| 27 | Temperature Low |
| 28 | Temperature High |
| 29 | Temperature OK |
| 31 | Driver ID (card reader input) |
| 32 | Driving with PTO ON |
| 33 | End driving with PTO ON |
| 40 | Motion based wake up event |
| 42 | Axis 1 acceleration trigger |
| 43 | Axis 1 deceleration trigger |
| 44 | Axis 2 acceleration trigger |
| 45 | Axis 2 deceleration trigger |
| 57 | Wake up from sleep mode |
| 58 | Button pressed event |
| 60 | System shutdown |
| 61 | Low battery |
| 70 | Polling event |
| 91 | Panic event |
| 99 | System fault |

Event Code Details:

Event 00; Power ON:

This event occurs only when system power is cycled

Event 01; fixed time event:

Time period set by user.

This event is based upon GPS time, with the time start set from first acquisition of GPS. Any time a GPS time signal meets or exceeds the preset time an event is generated.

Event 03; Distance triggered event:

Distance in miles set by user.

This event is based upon GPS distance, with the start set from first acquisition of GPS. Any time a GPS distance meets or exceeds the preset distance an event is generated.

Event 04; Enter low speed (Stop):

Trigger set by user in MPH.

Unit speed must remain below trigger speed for 10 seconds to trigger this event.

Event 05; Exit low speed (Start):

Trigger set by user in MPH.

Unit speed must remain above trigger speed for 10 seconds to trigger this event.

Event 06; Enter high speed (Speeding ON):

Trigger set by user in MPH.

Unit speed must remain above trigger speed for 30 seconds to trigger this event.

Event 07; Exit high speed (Speeding OFF):

Trigger set by user in MPH.

Unit speed must remain below trigger speed for 30 seconds to trigger this event.

Event 08; Ignition ON:

When this input (also known as input #1) is connected to the vehicle ignition, a transition from 0 (or float) to 12 volts triggers this event.

Event 09; Inputs #2 ON:

Transitions from 0 (or float) to 12 volts trigger this event.

Event 10; Inputs #3 ON:

Transitions from 12 (or float) to 0 volts trigger this event.

Event 11; Inputs #4 ON:

Transitions from 12 (or float) to 0 volts trigger this event.

Event 16; Ignition OFF:

When this input (also known as input #1) is connected to the vehicle ignition, a transition from 12 to 0 (or float) volts triggers this event.

Event 17; Inputs #2 OFF:

Transitions from 12 to 0 (or float) volts trigger this event.

Event 18; Inputs #3 OFF:

Transitions from 0 to 12 (or float) volts trigger this event.

Event 19; Inputs #4 OFF:

Transitions from 0 to 12 (or float) volts trigger this event.

Event 25; Lost GPS:

This event is triggered when GPS is lost. The last recorded GPS location is sent with this event.

Event 26; Acquire GPS:

This event is triggered when GPS signal is acquired. This event occurs when GPS satellites are first acquired on power up or after a lost GPS event.

Event 27; Temperature low:

Trigger set by user in degrees C.

This event occurs if an analog temperature monitor is connected to analog in 1, or if a digital trip point temperature monitor is connected to input #3 and temperature goes below trigger point.

Event 28; Temperature high:

Trigger set by user in degrees C.

This event occurs if an analog temperature monitor is connected to analog in 1, or if a digital trip point temperature monitor is connected to input #4 and temperature goes above trigger point.

Event 29; Temperature OK:

Trigger set by user in degrees C.

This event occurs if an analog temperature monitor is connected to analog in 1, or if a digital trip point temperature monitor is connected to input #3 and input #4, and temperature goes above low trigger point or below high trigger point. The event occurs once for each transition.

Event 31; Driver ID (card reader input):

This event is triggered by an input from a card reader. Data from all tracks of the card reader is transmitted.

Event 32; Driving with PTO ON:

Event 33; End driving with PTO ON:

Event 40; Motion based wake up event:

This event is triggered if a system is brought out of sleep mode by the on board motion detector. Motion must be sustained and continuous for at least 10 seconds.

Event 42; Axis 1 acceleration trigger:

Trigger set by user in g ($1\text{ g} = 10\text{ m/s}^2$).

This event occurs if an analog accelerometer is connected to analog input #2 and the acceleration goes above the preset trigger point.

Event 43; Axis 1 deceleration trigger:

Trigger set by user in g ($1\text{ g} = 10\text{ m/s}^2$).

This event occurs if an analog accelerometer is connected to analog input #2 and the acceleration goes below the preset trigger point.

Event 44; Axis 2 acceleration trigger:

Trigger set by user in g ($1\text{ g} = 10\text{ m/s}^2$).

This event occurs if an analog accelerometer is connected to analog input #3 and the acceleration goes above the preset trigger point.

Event 45; Axis 2 deceleration trigger:

Trigger set by user in g ($1\text{ g} = 10\text{ m/s}^2$).

This event occurs if an analog accelerometer is connected to analog input #3 and the acceleration goes below the preset trigger point.

Event 57 Wake up from sleep:

Event 58 Key event:

Event 60 System shutdown:

Event 61 Low Battery:

Event 70 Polling:

Event 91 Panic:

Event 99 System fault:

This event occurs when a system fault is detected. Details of the fault are transmitted along with the event code.

DATA MESSAGE FORMAT FOR NOVATRACKER TRACKING DEVICES (Comma Separated Fields)

| Comments | Device |
|--|----------|
| \$AVRMC = Normal transmission | All |
| \$AVLOG = logged data | All |
| \$AVSYS = system information | All |
| \$AVSET = Parameter reset information | All |
| 8 digit unit ID - (will move to 9 digits at some time in the near future) | All |
| GPS 24 hour GMT time | All |
| A - ACTIVE: Current GPS data follows; V - VOID: Previous GPS data follows | All |
| ddmm.mmmmm | All |
| N: North; S: South | All |
| dddmm.mmmmm | All |
| E: East; W: West | All |
| knots | All |
| | All |
| GPS Date | All |
| | All |
| | All |
| Time and date when the event (internal or external) occurred. Derived from device RTC; synced to GMT | All |
| Device generated event/status codes (2 digits) | All |
| Device status code (DIS; MSL; TIM) or input from buttons on face of device (3 characters) | All |
| Input from buttons on face of device, represents a value associated to the Code | GT, AU |
| 10 bit (3 digit hexadecimal) number. Convert to Decimal and multiply by 0.00625V to get true battery voltage level | GT,AT,CT |
| Analog in 2 (10 bit [3 digit hexadecimal] number) | AU, MB |
| Analog in 3 (10 bit [3 digit hexadecimal] number) | AU |
| Analog in 4 (10 bit [3 digit hexadecimal] number) | AU |
| Digital in (4 bit [1 digit hexadecimal] number) | AU, MB |

| | |
|---|------------|
| Used to determine Motion vs. Movement | GT, AT, CT |
| What is the confidence level that there is motion vs. movement (the logic of that algorithm can be in the device) could be H M L High, Medium, or Low. This could also be represented as a number instead | GT |
| Time and date when the data packet was sent from the device. Derived from device RTC; synced to GMT | GT |
| Distance accumulated in miles. Can be set to a starting value by a server message. | All |
| future use | |
| future use | |
| | All |
| Signifies end of data string | All |

7. Regulation

Warning:

The MiniTrac unit must be installed and operated at a minimum distance of 20 cm between the MiniTrac unit and your body. This unit must not be co-located or operating in conjunction with any other antenna or transmitter.

Changes or modifications made to this unit not expressly approved by NovaTracker may void the FCC authorization to operate this equipment.

Compliance:

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna
2. Increase the separation between the equipment and the receiver
3. Consult the manufacturer or supplier for help

8. Trouble Shooting Guide

Problems that may occur when installing/using the NovaTracker™ AVL

1: *Cannot connect to GSM network*

Solutions:

- Check SIM card; make sure it is installed correctly.
- Check Antenna installation; Antenna must be connected internally with adhesive side facing up (toward the sky with a unobstructed view).
- Check with your SIM card provider.

2: *No GPS light (No GPS connection)*

Solutions:

- Check antenna installation; antenna must be connected internally with adhesive side facing up.
- Check antenna location; must have full view of the sky and not be mounted near metal.
- Move the vehicle. Something may be blocking satellite reception.

3: *Unit reports strange speeds or positions*

Solutions:

- Unit and/or antenna are not installed correctly. Check power and ground connections. If incorrectly installed, a low voltage condition will occur, causing erroneous readings.